

Modeling Well-Bore Instability Using Statistical Models of Rock Fracture

Statistical models improve understanding of rock-fracture processes that cause well-bore instability

Well-bore instability is frequently encountered in the exploration and development of oil fields. Collapse of a well bore because of sanding or well-bore breakout can dramatically increase drilling and completion costs and may cause a well to be abandoned. Instability of a well bore is often due to progressive or time-dependent fracture of the rock formation and

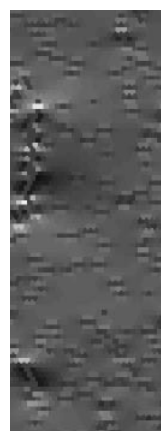
is not easily simulated using the numerical models currently available.

At LLNL, we are using a new statistical model to improve our understanding of the rock-fracture processes that cause well-bore instability. Our

objectives are to develop (1) a computational tool that will provide improved estimates of the minimum drilling fluid density required to maintain stability of high-angle or horizontal wells and (2) the ability to anticipate and avoid excessive sand production from petroleum wells.

Special capabilities

Researchers at LLNL and the University of California at Berkeley have developed a statistical model for rock fracture in compression that simulates the progressive fracture of clastic rocks common in the oil field. This model allows us to



Images showing progression of a fracture as predicted by LLNL's statistical model.

APPLICATIONS

- Estimate the minimum drilling fluid needed for high-angle wells or horizontal wells
- Anticipate and avoid excessive sand production in petroleum wells

explore how disorder inherent in the rock formation affects the process of fracture. The model could be applied to analyze well bores in a variety of subsurface environments. LLNL also has an experienced geoscience staff and a high-performance computing capability, both of which are needed to supplement and balance the experts provided by industry.

Availability: Available now; LLNL is interested in collaborating with industrial partners to further develop this modeling capability.

Contact

Stephen C. Blair
 Phone: (510) 422-6467
 Fax: (510) 423-1057
 E-mail: blair5@llnl.gov
 Mail code: L-201